

Profile SFR-5

HTTCSL

CHINA

GENERAL INFORMATION

NAME OF THE FACILITY High Temperature Thermal Convection Sodium Loop
ACRONYM HTTCSL
COOLANT(S) OF THE FACILITY SODIUM
LOCATION (address): China Institute of Atomic Energy(CIAE), P.O.Box 275 (34), 102413, Beijing, China
OPERATOR CIAE
CONTACT PERSON LONG Bin, P.O.Box 275 (34), 102413, Beijing, China, Department of Fast Reactor Research and Design, [Tel:+86-10-69357613](tel:+86-10-69357613) , Email:bin.long@hotmail.com; binlong@ciae.ac.cn
(name, address, institute, function, telephone, email):

STATUS OF THE FACILITY Standby
Start of operation (date): 2001

MAIN RESEARCH FIELD(S)

- Zero power facility for V&V and licensing purposes
- Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
- Thermal-hydraulics
- Coolant chemistry
- Materials
- Systems and components
- Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

High temperature thermal convection sodium loop (HTTCSL) is a natural convection circulation test loop to study the corrosion behavior of structural materials in flowing sodium for sodium-cooled fast reactor (SFR)..

HTTCSL basically consists of a test section which could hold around 20 pieces coupon, a surge tank, a storage tank, a finger-type cold trap to purify the sodium during its operation, a glove box which connected to the test section to perform sample loading and unloading, a cover gas system and instrumentation and control system.

The objects of this loop are:

Long-term corrosion investigations of structural materials in flowing sodium.

- ☑ Long-term corrosion investigations of coated materials in flowing sodium.
- ☑ Long-term corrosion investigations of structural materials in sodium vapour.
- ☑ Investigations on fundamental mechanisms of material/sodium interactions.
- ☑ Investigations and benchmarking of corrosion/precipitation and system kinetics models.

Acceptance of radioactive material

No

Scheme/diagram

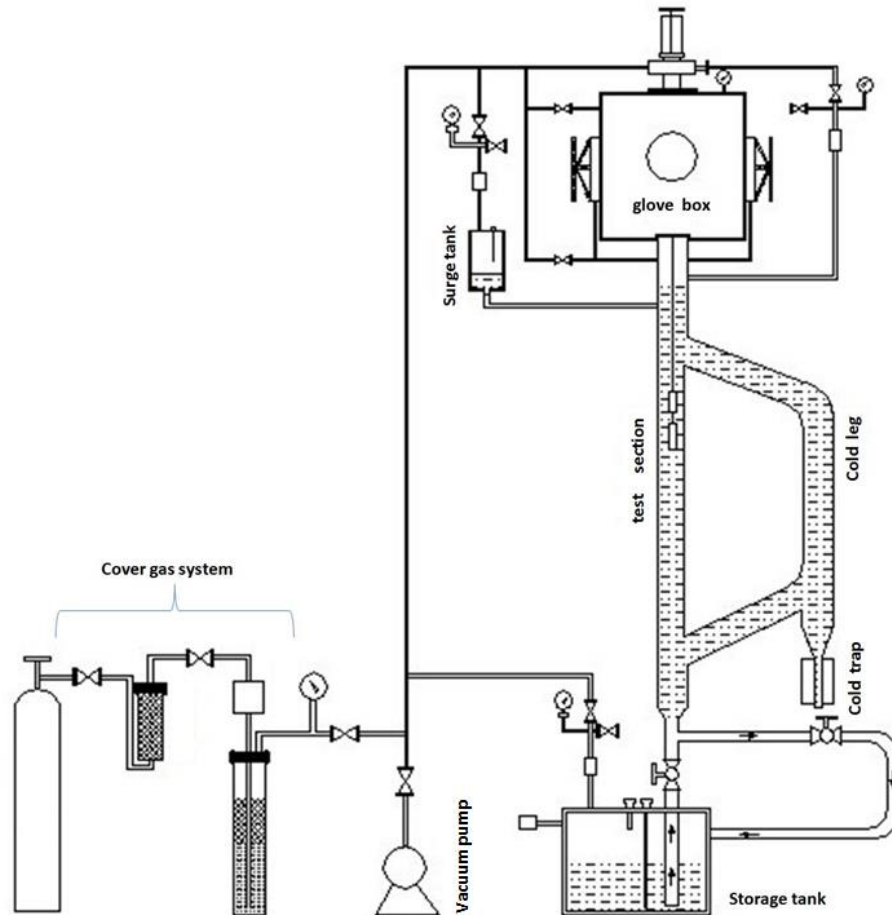


FIG..1. The diagram of HTTCSL

3D drawing/photo



FIG. 2. The HTTCSL loop

Parameters table

Coolant inventory	5 kg
Power	Max 15 kW
Test sections	
TS #1	<u>Characteristic dimensions</u> inside diameter 50 mm Overall height →850 mm
	<u>Static/dynamic experiment</u> Dynamic
	<u>Temperature range in the test section (Delta T)</u> 400°C-550°C
	<u>Operating pressure and design pressure</u> Operating Pressure →0.01MPa (gauge) Design pressure →0.2MPa
	<u>Flow range (mass, velocity, etc.)</u> The maximum sodium velocity on the surface of specimen is 5 cm/s
Coolant chemistry measurement and control (active or not, measured parameters)	There is one finger-type cold traps in the circuit to guarantee the sodium purification process on line. The plugging temperature in the meter is lower than 130 °C when the circuit is on operation. The off-line measurement is available and the oxygen content dissolved in the sodium can be used and the limit for this loop is lower than 12ppm.
Instrumentation	Thermocouples, pressure transducer, Gas purification and injection system

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

A first experimental campaign was conducted to verify the structural materials used for China Experimental Fast Reactor (CEFR) in 2001. After that, serials test were performed in this loop during the development the new structural materials, including ODS, T91 steel and et.al. The total operation time is about 20,000 hours.

PLANNED EXPERIMENTS (including time schedule)

No experiment is on the planning in near time..

TRAINING ACTIVITIES

Training activities can be agreed with CIAE for the operation of the experimental campaign under the supervision of CIAE qualified staff.

REFERENCES (*specification of availability and language*)

- [1] LONG B., XU Y.L., CHEN S.Y, LI H.Q., The high temperature sodium thermal convection loop, *Annual report of China experimental fast reactor*, pp.241-243, March, 2002. (in Chinese)
- [2] B.LONG, Y.XU, J.Q.ZHANG, D.ZHANG, NEA, 2012, p121-131.
- [3] XU Y.L., ZHANG J.Q., Corrosion of the weldments for outlet (inlet) pipe of CEFR super-heater in high temperature sodium, *Chinese Journal of Nuclear Science and Engineering*, Vol.29, No.4, pp. 316-323, Dec. 2009. (In Chinese)
- [4] XU Y.L., ZHANG J.Q., LI H.Q., ZHANG D.D., Corrosion of weldments for CEFR main vessel neck support in high sodium and sodium vapour, *Chinese Journal of Nuclear Science and Engineering*, Vol.29, No.3, pp. 221-227, Sept. 2009. (In Chinese)